photographs of the x-rays. "While a picture produced by an x-ray cannot be verified as a true representation of the subject in the same way that a picture made by a camera can be, the rule in regard to the use of ordinary photographs on the trial of a cause applies *to photographs of the internal structure and conditions of the human body taken by aid of x-rays, and such a photograph,* when verified by proof that it is a true representation (citing *Kimball* vs. *Northern Electric Co.*, 159 Cal. 225 (113 Pac. 156), among others), is admissible in evidence." (Citing *Bruce* vs. *Western Pipe etc. Co.*, 177 Cal. 25 (169 Pac. 660), among others; 22 C. J. 916; see, also, note in 77 A. L. R. 946.) *"It is no objection to the admissibility of a photograph that it is enlarged, showing the subject or object magnified, where this does not have a tendency to mislead.* Photographs of instruments already in evidence which are so enlarged as to make the proportions plainer and to illustrate the testimony of the witnesses may go to the jury in the same way as would a magnifying glass or microscope." (22 C. J. 918.) It is for the trial court to determine from the evidence before it whether enlargements of photographs already in evidence are correct representations thereof, and its ruling will be sustained unless it is apparent that there has been an abuse of discretion.

It is apparent that the Court did not fully comprehend the vital distinction between a photograph and a roentgenogram. To the person untrained in roentgenology, the decision in *Sim* vs. *Weeks* and the "technical side—professional side" theory may appear somewhat reasonable and logical, but when it is explained that a roentgenogram and a photograph are entirely different, that photography is a mechanical process that records upon a film reflected light of varying intensity and produces a representation of the surface of physical objects as they appear to the human eye, while roentgenography does not record reflected light but is the process by which the effect of x-rays, passing through various human tissues, is recorded upon a film and thereby produces a record of the transparency of the various tissues to the x-ray, it is readily enough understood that the analogy between photography and roentgenology must fail.

# SPECIAL ARTICLES

## RATTLESNAKE-BITES

Health officers who may be interested in the life history of rattlesnakes, including habitats, control, bite and treatment, together with list of species and subspecies, will find a complete report in a recent publication of the San Diego Society of Natural History. It was written by Laurence M. Klauber, Curator of Reptiles and Amphibians for the Society. A nominal price, to pay the cost of publication, has been set.

Concerning rattlesnake bite and its treatment, the author makes the following statement:

"Although rattlesnakes are moderately plentiful in many areas of the United States which are frequented by large populations, especially on week-end excursions, hunting or fishing trips, or by hikers or campers, rattlesnake bite constitutes a relatively small accident risk; not to be compared, for example, to the chance of a highway accident. The naturally inoffensive and secretive character of the snakes, and the fact that people going abroad are usually well protected about the legs, reduce accidents. Only in a few areas of our country is the snake-bite problem sufficiently important to warrant much attention.

"The gravity of a rattlesnake bite is something which cannot be closely defined or predicted any more than one might predict the seriousness of a fall, without knowing the exact circumstances surrounding the accident, such as the height of the fall, the character of the surface struck, etc. And in a snake-bite case the conditions are even more obscure, since there are important factors which cannot be ascertained, even after the accident has occurred. So no one can give an offhand opinion as to the gravity of such a case; and correspondingly, while there should be no desire to exaggerate the gravity, it will be best, in the interest of safety, to overtreat rather than undertreat the case, provided a proper treatment is used. In any event the victim should remain under close observation for at least forty-eight hours.

"Some of the more important variable factors involved in snake-bite cases are the following:

"1. The size, vigor, and health of the victim, these being important in determining absorptive power and resistance to venom.

"2. The allergy complex of the victim; his susceptibility to protein poisoning; sensitization (anaphylaxis), or partial immunity imposed by previous bites and treatment. Some individuals are so susceptible to venom that the mere handling of it causes typical asthmatic symptoms lasting for twenty-four hours or more; most persons under similar circumstances are entirely unaffected.

"3. The psychological condition and nature of the victim; extreme fear, and apprehension will affect heart action and, therefore, rapidity of absorption; and it is not impossible that there may be more direct reactions.

"4. The site of the bite, which will be less dangerous in the extremities, or in tissues where absorption will be less rapid (fat, for example), as compared with a bite near the vital organs or penetrating a vein.

"5. The nature of the bite, whether a direct stroke with both fangs fully imbedded, or a glancing blow or scratch. The movement of the victim (jumping backward, for instance) may cause a partially ineffective bite; or a bone may be struck, thus causing imperfect penetration. The snake may misjudge his distance and have the fangs only partially erected at contact, thus resulting in only slight penetration; or he may, for the same reason, eject venom before the fangs are imbedded.

"6. The protection afforded by clothing, which, by interposing thickness, will permit less depth of fang penetration, and will cause the external and harmless absorption of part of the venom. Only the point of the fang may penetrate the skin, in which case there will be no venom injection, for the orifice is well above the tip.

"7. The number of bites; occasionally an accident involves two or more distinct bites.

"8. The length of time the snake holds on; it may withdraw or be torn loose before injection takes place. This is likely to be more important with the elapine snakes, with their less specialized fangs, than with such long- and hook-fanged snakes as the rattlers.

"9. The extent of the anger or fear upon the part of the snake. The muscles which wring the venom glands and thus inject venom are separately controlled from the biting mechanism. The snake's natural tendency is to withhold venom, since this is his means of securing prey; but if hurt or violently angered he is likely to inject a large part of the venom contained in the glands.

"10. The species and size of the snake, affecting venom toxicity and physiological effects, venom quantity, and (by reason of length and strength of fangs) depth of injection. The age of the snake is, likewise, important; not only are young snakes less dangerous because of their smaller size (and, therefore, reduced quantity of venom), but also the venom is less toxic, judging from the reduced proportional recovery of solids upon evaporation. Snakes which have passed their prime also probably secrete less venom and of a reduced quality.

"11. The condition of the venom glands, whether full, or partially depleted or evacuated by reason of recent feeding, defense, ill health, or captivity. The season of the year (proximity to aestivation or hibernation) may also cause a variation, but this is not definitely known.

"12. The condition of the fangs, whether entire or broken, lately renewed or ready for shedding.

"13. The presence, in the mouth of the snake, of various microörganisms, some of which, gaining access to the wound, may, abetted by the antibactericidal effect of the venom, entail serious sequelae.

"14. The nature of the instinctive first-aid treatment, if any, such as suction, or circulation stoppage by pressure.

"To conclude, with variable factors of such importance, it is to be expected that some cases will prove extremely grave, whereas others may cause little or no discomfort. It is the latter class (which really require no treatment) that have given an entirely fictitious value and reputation to some of the remedies which have been proposed, for

the patient recovers in spite of the remedy, rather than through its use.

"In general, it can be said that even with the crudest treatment, or with no treatment of any kind, rattlesnake bite would probably not be fatal in more than 10 per cent of the cases, although greater with some especially dangerous species. Snake bite is likely to be more serious in the case of children, since the ability of a body to absorb venom without fatal results, varies with the weight. With proper treatment the mortality from rattlesnake bite should be less than 3 or 4 per cent.

"In the case of an accident of this kind, be sure that the snake which has inflicted the wound is a venomous snake. Many harmless snakes will bite fiercely when trod upon or captured, but their bites are without any untoward effects; they are no more serious than a scratch and should be given a like antiseptic treatment. Nevertheless, there are authentic instances in which grave results, and even death, have been caused by fear following the bite of a harmless snake.

"The actual injection of rattlesnake venom into a wound is followed immediately by severe local pain in almost every case, and this should be used as a criterion in determining whether the bite is that of a rattler, and if venom has actually been injected. With most species a marked swelling is also evident within a very short time.

"Assuming that a person has actually been bitten by a rattlesnake, the following procedure should be adopted by the victim and his companions, if any be present:

"1. The victim should not become unduly alarmed or excited, and should not run, for to do so will speed up the circulation and the rapidity with which the venom is absorbed. Remember, that few cases of rattlesnake bite are fatal.

"2. Apply a tourniquet between the bite and the heart. This may be a shoestring, necktie, or a rubber band. Rubber tubing makes the best tourniquet. Do not tie it too tightly. Complete stoppage of the circulation is unnecessary and undesirable, but the venous flow should be impeded. Loosen the tourniquet briefly at fifteen-minute intervals.

"3. With a sharp instrument, such as a razor blade or a knife, make a cross-incision over each fang mark, or connect the two with a single incision. The depth should be about equal to that of the fang, say a quarter of an inch if the snake is of moderate size. Before using, sterilize the cutting instrument if possible, using iodin, alcohol, or the flame of a match.

"4. Apply suction to the wound and the incisions thus made, either with the mouth or using one of the cupping or suction devices [1] which have been placed in first-aid kits for this purpose. Apply this continuously for at least half an hour. In a healthy person with good teeth there need be no fear of getting venom into the mouth or stomach with untoward results.

"5. If antivenin is available, use it in accordance with the instructions accompanying the syringe. However, do not depend upon it as a cure-all. Remember that antivenin and suction are not mutually exclusive; use antivenin if available, but the suction procedure should be carried through in any case.

"6. If swelling or discoloration progresses up the limb, additional cross-incisions should be made above this point and suction should be applied there, the tourniquet having been moved above the swelling. It is best to put on a second tourniquet before removing the first.

"7. If the patient is faint, give a cup of strong coffee or a teaspoonful of aromatic spirits of ammonia in a glass of water.

"8. Get the patient to a doctor or hospital as soon as possible, securing a physician experienced in previous snake-bite cases if one be available.

"9. Do not do any of the following things: Do not use potassium permanganate. Do not give whiskey. Do not burn or cauterize the wound, since this will interfere with the all-important suction and drainage. Do not use "folklore" remedies; they are a waste of time when time is valuable.

"10. If the physician in charge of the case has not had previous experience, he can secure advice from the United States Public Health Service by wire. The case should be closely watched for the first twenty-four and, preferably, the first forty-eight hours. Some cases have been lost because the decline in the prominent hemorrhagic symptoms (evidenced by local swelling and discoloration) seemed to indicate that the danger was past, to be followed by a sudden and unexpected onset of neurotoxic symptoms. It is suggested that physicians called upon to treat rattlesnake bite, study the publications of the United States Public Health Service, or those of Dr. Dudley Jackson of San Antonio, who has had a wide experience in this field; also the literature accompanying some of the suction devices now on the market in safety-first kits,[2] and the publications accompanying antivenin ampouls contain much useful information. It should be remembered, however, that these directions may be slightly biased, as there has been some factional disagreement concerning the relative merits of antivenin and suction. I repeat that antivenin and suction are not mutually exclusive remedies; both should be used extensively in serious cases. The victim should always be typed so that a blood transfusion, if necessary, may be made without delay. Neurotoxic symptoms, frequently involving paralysis of the respiratory center, call for additional antivenin treatment. The physician will use intravenous injections of glucose and normal salt solution as necessitated.

"The carrying of kits containing suction devices (there are several good ones on the market) is to be recommended to campers, hunters, or others going into rattler-infested country. This is said without any desire to frighten people or to exaggerate the chance of snake bite, which is indeed remote. It is, however, a reasonable insurance precaution.

"The above brief remarks on the treatment of rattlesnake bite do not more than skim the surface. It must be remembered that most of the experience in this country has been in the treatment of cases of C. cinereous bite and that of closely allied species. Rattlesnake venom is an exceedingly complex protein poison, having a variety of effects, neurotoxic, hemolytic, cytolytic, antibactericidal, etc. These effects probably differ considerably in the several species. It is well known that the venom of C. durissus differs extensively in its effects from that of C. cinereous and some of our more common nearctic species. We may well expect that future research will show that others of our North American rattlers have quite different effects from C. cinereous. This, in turn, may influence the development of antivenins and otherwise profoundly change the present recognized methods of treatment. Polyvalent antivenins cannot be made as effective as those to counteract the bite of specific snakes. Probably this is one of the reasons why Brazilian anticrotalus serum has been so successful; as there is but one species of rattlesnake in that country the antivenin is specific. In our country the situation is quite different. I anticipate that the future will see the venoms of our rattlers grouped in classes, with an antivenin for each class, although this could not be a successful commercial venture. In extensive areas of the country, where only one or two species of rattlers occur, only a single class would be required."

[1] The rubber-bulb type is probably to be preferred, since it will continue its action without an operator.

[2] The directions accompanying the Dudley First-Aid Kit are particularly complete with respect to the procedure of the suction treatment, both in the field and hospital.

Democracy, being a state of society as well as a form of government, aims to secure the well-being of the whole people. Often interrupted, but too good to be long neglected, it has been tried in Greece, Rome, France, England, America, and a few other lands. Problems arose. Some were solved. One, however, as yet unsolved, will be long in the deliberative councils of the people, namely, the drift toward mediocrity. Concerning it, Dr. Eugene W. Hilgard once said: "You will see a mediocrity in this country and throughout the western world, which is the price of lifting the masses. Since that upward course is theirs by right, it must be pleasantly borne. The leaven will appear to be lost. In reality, it never can be. We cannot fail."